

**WHAT IS CLAIMED IS:**

1           1.     An integrated circuit fabrication process, the process comprising:  
2                 exposing a photoresist material provided including arylalkoxysilane  
3     over a substrate to a first radiation at a first lithographic wavelength;  
4                 selectively transforming a top portion of the material in accordance  
5     with a pattern provided on a mask or reticle; and  
6                 exposing the photoresist material to a second radiation at a second  
7     lithographic wavelength,  
8                 wherein the first lithographic wavelength is shorter than the second  
9     lithographic wavelength and the transformed top portion of the photoresist material  
10    being non-transparent to the second radiation.

1           2.     The process of claim 1, wherein the first lithographic wavelength is  
2     selected from a wavelength including 157 nm, 126 nm, and 13.4 nm.

1           3.     The process of claim 1, wherein the second lithographic wavelength  
2     is selected from a wavelength including 365 nm, 248 nm, and 193 nm.

1           4.     The process of claim 1, wherein the exposing step with the first  
2     radiation is performed before the exposing step with the second radiation.

1           5.     The process of claim 1, further comprising providing the transformed  
2     top portion of the photoresist material as a self-aligned mask for the exposing step  
3     with the second radiation.

1           6.     The process of claim 1, wherein the photoresist material is a positive  
2     photoresist material.

1           7.     The process of claim 1, wherein the transformed top portion of the  
2     photoresist material comprises polymerized organoarylalkoxysilane material.

1           8.       The process of claim 7, wherein the thickness of the transformed top  
2       portion is at least 10 nm.

1           9.       The process of claim 1, further comprising transferring the pattern of  
2       the mask or reticle onto the photoresist material, wherein a resolution of the  
3       transferred pattern is determined by the first lithographic wavelength.

1           10.      An integrated circuit fabrication system, comprising:  
2                    a first light source providing a first radiation at a first lithographic  
3       wavelength;  
4                    a second light source providing a second radiation at a second  
5       lithographic wavelength; and  
6                    a self-aligned mask included in a photoresist layer, the self-aligned  
7       mask formed by exposure to the first radiation at the first lithographic wavelength in  
8       accordance with a patterned mask or reticle.

1           11.      The system of claim 10, wherein the first lithographic wavelength is  
2       smaller than the second lithographic wavelength.

1           12.      The system of claim 11, wherein the first lithographic wavelength is  
2       selected from a wavelength including 157 nm, 126 nm, and 13.4 nm.

1           13.      The system of claim 11, wherein the second lithographic wavelength  
2       is selected from a wavelength including 365 nm, 248 nm, and 193 nm.

1           14.      The system of claim 10, wherein the photoresist layer is comprised of  
2       positive photoresist material.

1           15.      The system of claim 10, wherein the self-aligned mask comprises at  
2       least one cross-linked and or   polymerized area of a top arylalkoxysilane layer.

1           16.     The system of claim 15, wherein the self-aligned mask is located at  
2     the top portion of the photoresist layer and has a thickness between 10 nm and  
3     10000 nm.

1           17.     The system of claim 16, wherein each of the polymerized area  
2     prevents the second radiation from transforming the portion of the photoresist layer  
3     correspondingly underneath.

1           18.     A method of extending the use of 248 nm and 193 nm photoresists to  
2     lithographic regimes less than approximately 157 nm in an integrated circuit, the  
3     method comprising:

4                     providing a first radiation at a short lithographic wavelength; and  
5                     transforming a top portion of a photoresist layer provided over a  
6     substrate in accordance with a pattern on a mask or reticle, wherein the transformed  
7     top portion on top of the photoresist layer includes at least one polymerized area  
8     where the first radiation is incident thereon and comprises the pattern from the mask  
9     or reticle.

1           19.     The method of claim 18, further comprising providing a second  
2     radiation at a long lithographic wavelength after providing a first radiation, wherein  
3     the short lithographic wavelength is smaller than the long lithographic wavelength.

1           20.     The method of claim 19, wherein the mask or reticle is omitted at a  
2     second radiation step.

1           21.     The method of claim 19, wherein the second radiation is not  
2     transmitted through the polymerized area.

1           22.     The method of claim 21, further comprising patterning the photoresist  
2     layer in accordance with each of a plurality of polymerized areas on top of the  
3     photoresist layer and the second radiation, wherein the resolution of the patterned

- 4 photoresist layer is determined by the short lithographic wavelength of the first
- 5 radiation.